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NYMPHON TORULUM, NEW SPECIES AND OTHER PYCNOGONIDA ASSOCIATED WITH THE CORAL *OCULINA VARICOSA* ON THE EAST COAST OF FLORIDA

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ABSTRACT

Eighty-eight identified pycnogonid specimens belonging to 15 species of 11 genera in six families were found associated with the coral *Oculina varicosa* Lesueur off the east coast of Florida. One new species, *Nymphon torulum,* is fully described, illustrated, and compared with its congeners. Distribution is given for all 15 species along with pertinent remarks, except for several juvenile or damaged specimens assigned to genus only.

During the course of an offshore survey in southern Florida to study growth and other aspects of the coral *Oculina varicosa* Lesueur, fauna incidentally associated with the coral specimens was routinely sorted and preserved for identification. The pycnogonids associated with this shallow-water coral form a broad cross section of species known to inhabit the Florida coast. A total of 15 species in 11 genera and six families of pycnogonids are reported as coral associates. One new species, *Nymphon torulum*, was found with several specimens of this coral and is described, illustrated, and compared with a similar species. A small number of specimens are identified only to genus for lack of good specimens.

It is not possible to state with any certainty that any, some, or all of the pycnogonids were feeding on coral soft parts, but considering the large number of pycnogonid specimens taken during this survey, it is probable that at least some were actively feeding on the corals. A number of reports list pycnogonids as carnivorous grazers on coral soft parts or mucus (e.g., Arnaud and Bamber, 1987: 46). There are also reports of many different species of pycnogonids found on the base of a variety of corals and other coelenterates.

Material

Most of the specimens taken from *Oculina varicosa* corals and the corals themselves were collected by the use of the research submersibles Johnson Sea-Link I and II. The divers used the expedient of “lock-out” diving in which the submersible, on reaching the desired depth, permits a diver to exit and collect undamaged specimens and subsequently reenter the lock-out chamber. The remainder of the specimens were collected by free scuba diving on rock outcrop ledges on which corals and other fauna grow.

Systematics

Family AMMOTHEIDAE Dohrn, 1881

Genus *Achelia* Verrill, 1900

Achelia sawayai Marcus

Achelia sawayai Marcus, 1940: 81–86, figs. 10a–f, 17.—Hedgpeth, 1948: 244–245, fig. 38e.—Child, 1992: 11–12 [literature], fig. 3.

Material.—JOHNSON SEA-LINK II (JSL) Cr. 9, sta. 288, 26°48′24″N, 079°58′36″W, 36.6 m, coll. S. Nelson with scuba, 16 Sep 75 (1♂, 1♀).

Remarks.—This species is the most common pycnogonid taken on this coast and appears in almost all systematic accounts of pycnogonids from Florida. It is distributed from Georgia to Brazil in littoral and sublittoral habitats. It has also been collected in many Indo-Pacific localities in 0–115 m.

Genus *Ammothella* Verrill, 1900

Ammothella appendiculata (Dohrn)

Ammothea appendiculata Dohrn, 1881:152-155, pl. VII, figs. 1–5.

Ammothella (*Ammothella*) *rugulosa* Verrill, 1900: 581, figs. 2, 3, pl. 70, fig. 90.

Ammothella appendiculata.—Cole, 1904: 323–324, pl. 21, figs. 15–18, pl. 22, figs. 19–20.—Child, 1992:12–13, fig. 4.

Ammothella rugulosa.—Marcus, 1940:92–93, fig. 12a–g.—Hedgpeth, 1948: 247, fig. 39a.—Child, 1982: 358–359.—Stock, 1986:400 [literature], (Table 1).

Material.—Ledge Dive (LD) 18A, B, 27°30′00″N, 080°17′ 00″W, 5.5 m, coll. L. Edmiston, J. Reed, with scuba, 28 Apr 77 (4♂, 2♀, 2 Juv).

Remarks.—A common species in the Florida littoral, it is distributed from Bermuda and Florida to Brazil.

Genus *Ascorhynchus* Sars, 1877

Ascorhynchus latipes (Cole)

Barana latipes Cole, 1906: 217–222, pls. 1, 2.

Ascorhynchus latipes.—Marcus, 1940: 93.—Hedgpeth, 1948: 256–257, fig. 42b.—Child, 1992: 21 [literature], fig. 7.

Material.—LD-18A, 27°30′00″N, 080°17′00″W, 5.5 m, coll. L. Edmiston with scuba, 28 Apr 77 (1 Juv).

Remarks.—This is another common species found in Florida and throughout the Caribbean at moderately shallow depths. It was also found at Dakar, Senegal, West Africa.

Ascorhynchus castellioides Stock

Ascorhynchus castellioides Stock, 1957: 82-84, fig. 2.—Child, 1979: 15 [literature].—Müller, 1992: 45.

Material.—SEA DIVER (SD), cr. 3, sta. 2179F, 27°41′00″N, 080°06′30″W, 28 m, coll. L. Edmiston with scuba, 21 Mar 77 (1♀).

Remarks.—Stock's species has been found commonly on dock pilings and other shallow habitats in scattered localities in Florida and the Caribbean.

Genus *Eurycyde* Schiödte, 1857

Eurycyde clitellaria Stock

Eurycyde clitellaria Stock, 1955: 263–266, figs. 25–26.—McCloskey, 1967: 128–131, figs. 18–21.—Child, 1979: 16; 1992: 25–26, fig. 10.

Material.—JSL I, cr. 47, sta. 1438A, 27°32′48″N, 079°58′48″W, 81.4 m, coll. L. Edmiston with scuba, 23 Aug 77 (1♂).

Remarks.—This species is not collected as often as its congener, *E. raphiaster* Loman, which has many Florida and Caribbean records at various depths from 1 to 90 m. Stock's species is known from North Carolina to Venezuela and the Caribbean in 29–100 m. It was also found on the Pacific side of Mexico.

It is characterized by having single slender dorsodistal tubercles on the anterior two or three pairs of lateral processes, similar anterior and posterior tubercles on all four pairs of lateral processes, and similarly placed tubercles on all first coxae. There are no large horizontal spines on the ocular tubercle as in *E. raphiaster*, although these are sometimes missing or broken off in long-preserved specimens, and no lateral process spines as in many species of this genus.

Genus *Tanystylum* Miers, 1879
Tanystylum hummelincki Stock

Tanystylum hummelincki Stock, 1954: 122–125, figs. 27–28.

Material.—LD-19A, 27°30′00″N, 080°17′00″W, 5.2 m, coll. J. Reed and L. Edmiston with scuba, 28 Apr 77 (1♂, 1♀, 1 larva); JSL I, cr. 5, sta. 273, 27°10′54″N, 080°02′30″W, 21.6 m, coll. T. Askew with scuba, 24 Jul 75 (1♂ with eggs, 1♂, 1♀, 1 Juv); JSL I, cr. 5, sta. 274, 27°10′42″N, 080°02′42″W, 22.9 m, coll. T. Askew with scuba, 25 Jul 75 (1♀).

Remarks.—This species has not been reported since Stock described the types from the Venezuelan Caribbean in 1–2 m. These three lots would suggest that it is not rare but only rarely collected. Unfortunately, the types of habitat, other than *Oculina* corals, in which these specimens were collected were not recorded along with other data and therefore can not give us any hint of habitat or food preference.

Tanystylum orbiculare Wilson

Tanystylum orbiculare Wilson, 1878: 5–7, pl. 2, fig. 2a–f.—Hedgpeth, 1948: 266–268, figs. 8, 49a.—Child, 1992: 33–35 [literature], fig. 15.

Material.—LD-19B, 27°30′00″N, 080°17′00″W, 5.5 m, coll. J. Reed and L. Edmiston, with scuba, 28 Apr 77 (1♂).

Remarks.—This well known species displays wide variation in many diagnostic characters. Authors have thus recorded its capture in shallow seas in many parts of the world. It is probable that some of these records involve other species although it has been found repeatedly in the north and south Atlantic and in some Pacific localities. It is known only from semilittoral and shallow localities. The female type was recently illustrated by Child (1992) along with a male oviger.

Family NYMPHONIDAE Wilson, 1878
Genus *Nymphon* Fabricius, 1794
Nymphon floridanum Hedgpeth

Nymphon floridanum Hedgpeth, 1948: 196–199, fig. 17.—Child, 1992: 71–72 [literature], fig. 33.

Material.—JSL I, cr. 9, sta. 288, 26°48′24″N, 079°58′36″W, 36.6 m, coll. S. Nelson with scuba, 16 Sep 75 (1♀); JSL I, cr. 47, sta. 1438B, 27°32′48″N, 079°58′48″W, 81.4 m, coll. L. Edmiston with scuba, 23 Aug 77 (1♀, 2 Juv); JSL II, cr. 27, sta. 2129A, 27°32′48″N, 079°58′48″W, 77.7 m, coll. J. Reed with scuba, 23 Sep 76 (1♀, 1 Juv); JSL II, cr. 37, sta. 2160A, same lat. and long., 73.8 m, coll. J. Reed with scuba, 2 Feb 77 (1♂); JSL II, cr. 42, sta. 2184A, same lat. and long., 80.2 m, coll. F. Stanton with scuba, 15 Apr 77 (2 Juv).

Remarks.—This is the most common *Nymphon* species in this locality. Among the *Nymphon* hordes it can be distinguished from several other species known to the Florida coast by several characters. It has a moderately long neck, an oviger terminal claw which lacks endal teeth, and chelae with teeth having bifurcate tips. It belongs to the *Nymphon aequidigitatum*-group of species which have chelae teeth usually with bifurcate tips, a terminal palp segment usually longer in relation to the other four segments, an oviger claw often without teeth, and auxiliary claws usually longer than the reduced main claw, some or all of which have tiny rugosities on their ventral sides.

It is nearest to *N. aemulum* Stock, another species of the *N. aequidigitatum*-group, but the latter species has a shorter neck, an oviger claw with endal teeth, and simple chelae teeth with a single point on each. The distribution of *N. floridanum* is known to be from Georgia and the Caribbean to French Guiana in depths of 0–70 m. It has also been taken in plankton tows.

Nymphon torulum new species
(Fig. 1)

Material.—JSL I, cr. 47, sta. 1438B, 27°32′48″N, 079°58′48″W, 81.4 m, coll. L. Edmiston with scuba, 23 Aug 77 (1♀ without legs, Paratype, USNM 180137); JSL II, cr. 27, sta. 2125A, same locality, lat. and long., 77.7 m, coll. J. Reed with scuba, 21 Sep 76 (1♂ with eggs, Holotype, USNM 180145; 1♀, 1 Juv, Paratypes, USNM 180146).

Distribution.—This new species is known only from the type locality, Jeff's Reef, off Fort Pierce, Florida, in 77–81 m.

Description.—A graceful slender species, its size small for this genus, leg span about 26 mm. Trunk slender, completely segmented, glabrous. Lateral processes narrow, as long as twice their diameters, separated by slightly more than twice their diameters, with tiny sharply pointed dorsodistal tubercle slightly taller than wide. Ocular tubercle broad, cylindrical, eyes large, lightly pigmented, tip rounded with pair of slender lateral tubercles. Oviger bases placed at posterior of neck touching first lateral processes, directly ventral to ocular tubercle. Neck long, slender, broadened distally at chelifore insertion which bears small slender dorsal tubercle on each. Proboscis moderately short, swollen in proximal half, cylindrical distally with rounded oral area. Abdomen short, erect, tapering distally, armed with 4 tiny distal setae.

Chelifores long, slender, scapes slightly longer than proboscis, armed with few short dorsal setae. Chelae very slender, fingers longer than cylindrical palm, tips with no distal overlap. Palm with several short dorsal and distal setae. Movable finger only slightly curved, with 38 slender pointed teeth, immovable finger straight, with 38 similar teeth.

Palps very slender, with few setae, some slightly longer than segment diameter, increasing in numbers distally. Second segment longest, third about 0.7 length of second, fourth less than half length of third, fifth longer than fourth, fourth and fifth combined slightly longer than third.

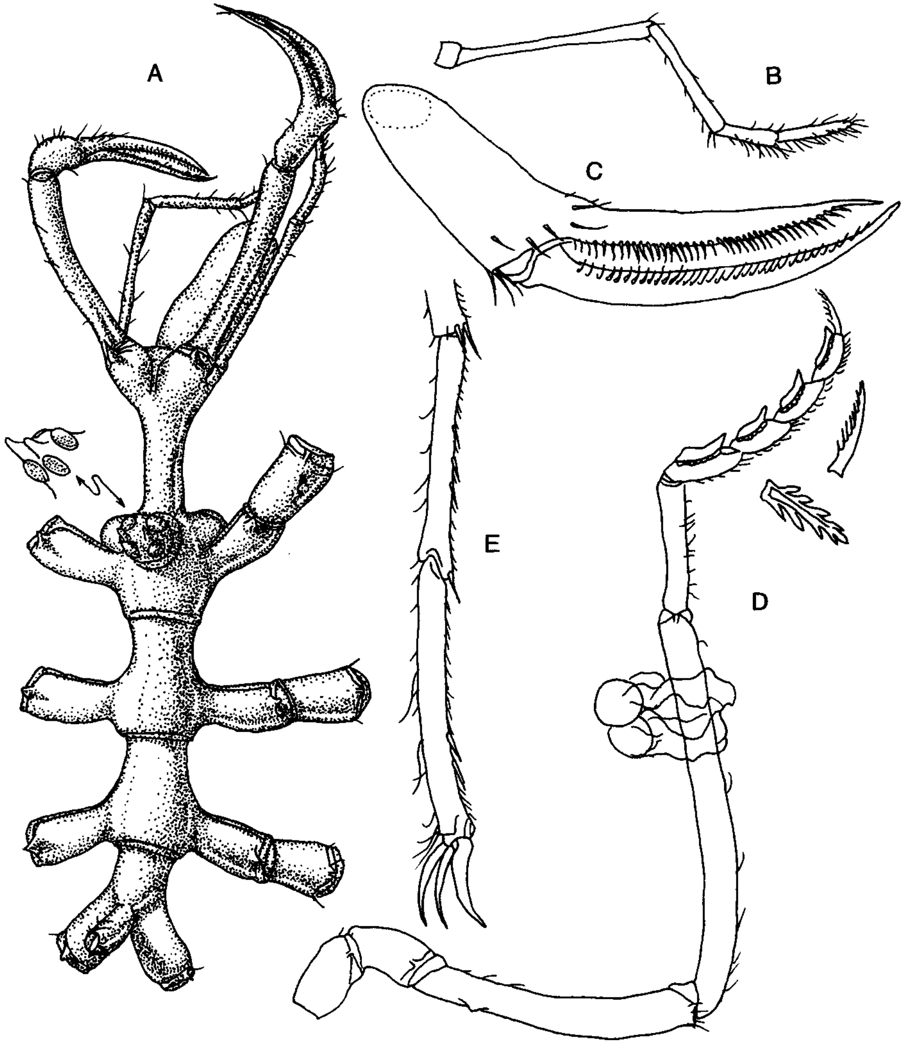

Figure 1. *Nymphon torulum*, new species, holotype male: A. trunk, dorsal view, with ocular tubercle in lateral view; B, palp; C, chela; D, oviger with two eggs; the terminal claw and a denticulate spine, enlarged; E, distal leg segments, enlarged.

Oviger moderately long, fourth segment moderately curved, about 0.8 as long as fifth, fifth curved only proximally, both major segments with few short lateral and distal setae. Sixth segment slender, with several short lateral setae. Strigilis segments small, each with row of ectal setae, endal denticulate spines in formula 10:7:7:7, terminal claw slender, with 8 narrow teeth. Denticulate spines with 4 lateral lobes.

Legs very slender, with several short setae on femur, short setae on tibiae increasingly dense distally, long dorsodistal seta on each major segment, and 7 small robust ventral spines on second tibiae, 4 on tarsus and 4 on propodus, mixed with shorter setae. Femora and first tibiae slightly inflated distally, femoral cement gland tubes or cups not evident.

Second tibiae the longest segments. Tarsus slightly shorter than propodus, both with rows of short sole spines among the longer spines, tarsus with row of short dorsal setae, propodus with both short and long dorsal setae. Claw slender, moderately curved, auxiliary claws as long as main claw.

Female characters similar; size slightly larger, oviger segment four and five subequal in length, total denticulate spine number 35–36, lateral process tubercles absent or papilla-like, and ocular tubercle apex with rounded bumps of variable size in place of pointed lateral tubercles.

Measurements (in mm.).—Trunk length (from chelifore insertion to tip of 4th lateral processes), 4.92; trunk width (across 2nd lateral processes), 1.03; proboscis length, 0.72; abdomen length, 0.35; third leg, coxa 1, 0.29; coxa 2, 1.03; coxa 3, 0.41; femur, 1.93; tibia 1, 3.04; tibia 2, 4.17; tarsus, 0.71; propodus, 0.79; claw, 0.25; auxiliary claws, 0.25.

Etymology.—The specific name (Latin: *torulus*, the diminutive of *torus*, meaning a protuberance or bulge) refers to the two horn-like tubercles at the ocular tubercle apex.

Remarks.—This new species has few outstanding characters with which to distinguish it from many similar species of *Nymphon*. One of the few characters not found on most species is the presence of tiny single conical tubercles dorsodistally on each lateral process. There are similar tubercles dorsal to the chelifore insertions, and a pair of similar tubercles at the ocular tubercle apex. Few species have such inconspicuous small tubercles in all of these places and none are found in the southeast coastal regions of the United States.

The species has several similarities to *N. vulsum* Stock (1986: 419–420, fig. 6b–j), taken in about 26 m off Isla Margarita on the Venezuelan coast. They share long necks, oviger bulges and ocular tubercles at the posterior end of the neck, slender palps and legs, and long tarsus in relation to the propodus. They differ in Stock's species having much shorter chelae fingers in relation to the palm, fewer finger teeth, and palp fourth and fifth segments subequal. His species leg femora and first tibiae are straight sided and not distally inflated (this is possibly only a sexual character although these segments of the female paratype here are slightly swollen), but the greatest difference is in the long slender main propodal claw in relation to the very short auxiliary claws of *N. vulsum*. Stock's unique type is a female and the femoral cement gland character of males remains unknown.

There are similarities in habitus to the slender species *N. angolense* Gordon, 1932, and *N. macrum* Wilson, 1880. The new species differs from *N. angolense* in having a shorter neck, shorter chelifores with a greater number of teeth, much longer tarsus, propodus, and auxiliary claws, and the conical tubercles. It differs from *N. macrum* in the same tubercles and by having shorter lateral processes, oviger bases placed against the anterior of first lateral processes, and slightly shorter tarsus and propodus lengths while having longer auxiliary claws. All three species are otherwise closely related in their morphology.

Family PYCNOGONIDAE Wilson, 1878

Genus *Pycnogonum* Brünnich, 1764

Pycnogonum cessaci Bouvier

Pycnogonum cessaci Bouvier, 1911: 493.—Child, 1979: 72 [literature].

Material.—LD-19C, 27°30′00″N, 080°17′00″W, 5.8 m, coll. J. Reed and L. Edmiston, with scuba, 28 Apr 77 (1♂, 1♀); LD-25A, 27°29′36″N, 080°17′18″W, 6.7 m, coll. J. Reed and L. Edmiston, with scuba, 12 Sep 77 (1♂, 1♀); JSL II, cr. 25, sta. 2100A and B, 27°32′48″N, 079°59′18″W, 75.6 m, coll. D. Girardin with scuba, 16 Aug 76 (1♂ with eggs, 4♂, 1♀, 6 Juv).

Remarks.—This is one of a small number of Amphiatlantic shallow-water species found on the coast of West Africa and in Florida, the Caribbean, and sometimes Brazil. It also is known from the Pacific coast of Panama. It is a species without reticulations, has variably small to tiny auxiliary claws, and males have 7-segmented ovigers.

Family CALLIPALLENIDAE Hilton, 1942
Genus *Callipallene* Flynn, 1929
Callipallene species indeterminate

Material.—JSL II, cr. 21, sta. 2048, 27° 11′36″N, 080°00′42″W, 41.1 m, coll. J. Reed with scuba, 18 May 76 (1 larva); JSL II, cr. 30, sta. 2147, 27°10′42″N, 080° 01′00″W, 43.3 m, coll. F. Stanton with scuba, 27 Oct 76 (1 larva).

Remarks.—These two specimens are much too young to determine, but are most likely the most common species from this locality, *C. brevirostris* (Johnston).

Genus *Pallenopsis* Wilson, 1881
Subgenus (*Pallenopsis*) Stock, 1975
Pallenopsis (*Pallenopsis*) *schmitti* Hedgpeth

Pallenopsis schmitti Hedgpeth, 1943:44; 1948:212–214, fig. 22.

Pallenopsis (*Pallenopsis*) *schmitti*.—Stock, 1975:1028–1030, fig. 30c–d.—Child, 1992: 65–67 [literature], fig. 30, table 10.

Material.—JSL II, cr. 24, sta. 2088, 26°56′36″N, 079°59′42″W, 42.1 m, coll. B. Cubberly with scuba, 1 Jul 76 (1♂); JSL II, cr. 38, sta. 2163B, 27°32′48″N, 079° 58′48″W, 80 m, coll. F. Stanton with scuba, 7 Feb 77 (1 Juv).

Remarks.—This is a large fairly shallow water species found from Florida and the Gulf of Mexico through the Caribbean to Brazil. It is the only one known from shallow waters on the Florida coast.

Family PHOXICHILIDIIDAE Sars, 1891
Genus *Anoplodactylus* Wilson, 1878
Anoplodactylus dauphinus Child

Anoplodactylus dauphinus Child, 1992: 43, 45–46, fig. 20.

Material.—There are no additional specimens of this species to report here as all known were types included in the above Gulf of Mexico survey.

Remarks.—The type series of this species were taken from *Oculina varicosa* specimens from both the Gulf and the Atlantic coasts of Florida. This fact was not mentioned in the remarks included with the types.

The species is one in which the males have two distally slanted cement gland tubes on each leg. There is only one other species known, *A. glandulifer* Stock, 1954 (syn.: *A.*

multiclavus Child), with more than one cement gland opening and collected in this vicinity (from Florida to Panama and the Caribbean). This species has from two to five tiny cups rather than the two larger tubes of *A. dauphinus*. Almost all other known species with multiple cement gland openings are from Europe or the Indo-Pacific areas.

Anoplodactylus insignis (Hoek)

Phoxichilidium insigne Hoek, 1881: 82–84, pl. 14, figs. 5–7, pl. 16, fig. 18k.
Anoplodactylus insignis.—Hedgpeth, 1948:226–228 [early literature], fig. 28d–g.—Child, 1992: 46–49 [recent literature], fig. 21, table 6.

Material.—LD-01, 27°29′36″N, 080°17′00″W, 5–8 m, coll. F. Stanton with scuba, 2 May 1975 (1♀); LD-03, same lat. and long., 7–8 m, coll. F. Stanton with scuba, 10 Jul 75 (1♀); JSL I, cr. 5, sta. 273, 27°10′54″N, 080°02′30″W, 21.6 m, coll. T. Askew with scuba, 24 Jul 75 (1♀); JSL I, cr. 47, sta. 1438B, 27°32′48″N, 079°58′48″W, 81.4 m, coll. L. Edmiston with scuba, 23 Aug 77 (1 Juv).

Remarks.—This species has conspicuous distal appendage tubercles which serve to distinguish it from all other known species in this area. It is known from many localities from Bermuda and Virginia to the Caribbean and Brazil.

Anoplodactylus petiolatus (Kroyer)

Phoxichilidium petiolatum Kroyer, 1845: 123
Anoplodactylus petiolatus.—Hedgpeth, 1948:222 (early literature), fig. 27a–d.—Child, 1992:53–55 (recent literature), fig. 24.

Material.—SD, cr. 2, sta. 328, 27°38′48″N, 080°04′48″W, 23.8 m, coll. S. Nelson with scuba, 18 Feb 76 (1♀); JSL II, cr. 21, sta. 2049, 27° 11′24″N, 080°00′54″W, 42.4 m, coll. M. Flake with scuba, 18 May 76 (1♂ with eggs); JSL II, cr. 30, sta. 2144B, 27°11′12″N, 080°01′00″W, 41.8 m, coll. F. Stanton with scuba, 26 Oct 76 (2♀, 3 larvae); JSL II, cr. 37, sta. 2161A, 27°10′48″N, 080° 00′48″W, 44.2 m, coll. F. Stanton with scuba, 3 Feb 77 (1♂, 2♀, 8 Juv and Larvae); JSL II, cr. 38, sta. 2163A, C, 27°32′48″N, 079°58′48″W, 80 m, coll. F. Stanton with scuba, 7 Feb 77 (1♀, 1 Juv); JSL II, cr. 42, sta. 2184A, same lat.and long., 80.2 m, coll. F. Stanton with scuba, 15 Apr 77 (1♀).

Remarks.—This species is among the most common on the Florida coast and offshore in floating *Sargassum*.

Anoplodactylus species indeterminable

Material.—LD-18B, 27°30′00″N, 080°17′00″W, 5.5 m, coll. J. Reed with scuba, 28 Apr 77 (1 larva); JSL II, cr. 20, sta. 2044A, 27°11′12″N, 080°01′06″W, 40.8 m, coll. J. Reed with scuba, 7 May 76 (1 larva); JSL II, cr. 37, sta. 2160A, 27°32′48″N, 079°58′48″W, 73.8 m, coll. J. Reed with scuba, 2 Feb 77 (1♀ damaged); JSL II, cr. 42, sta. 2184, 27°32′48″N, 079° 58′48″W, 80.2 m, coll. F. Stanton with scuba, 15 Apr 77 (2 Juv); JSL II, cr. 47, sta. 1438C, 27°32′48″N, 079°58′48″W, 81.4 m, coll. L. Edmiston with scuba, 23 Aug 77 (1 Juv).

Remarks.— These specimens are juveniles with inadequate diagnostic characters or badly damaged specimens.

Family ENDEIDIDAE

Genus *Endeis* Philippi, 1843

Endeis mollis (Carpenter)

Phoxichilus mollis Carpenter, 1904: 182, figs. 1–7.
Endeis mollis.—Child, 1979: 66 [literature].—Nakamura and Child, 1983: 41.—Stock, 1986: 440.—Child, 1988: 20–21.—Nakamura and Child, 1988: 664.

Material.—LD-17A, 27°30′00″N, 080°17′00″W, 6.1 m, coll. J. Reed with scuba, 25 Jan 77 (1♂); JSL I, cr. 5, sta. 273, 27°10′54″N, 080°02′30″W, 21.6 m, 24 Jul 75 (1♀ Juv).

Remarks.—This pantropical species is recognized by its lack of gut diverticula, its straight femora without swellings, its small leg setae, and in the male, its straight row of cement gland pores.

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LITERATURE CITED

Arnaud, F. and Bamber, R. N. 1987. Biology of Pycnogonida. Adv. Mar. Biol. 24: 1–95.

Bouvier, E. L. 1911. Observations sur les Pycnogonomorphes et principalement sur le *Pentapycnon Geayi*, expèce tropicale à dix pattes. Comptes Rendus des Séances Hebdomadaires de l'Académie des Sciences, Paris 152: 491–494.

Brünnich, M. T. 1764. Entomologia sistens Insectorum Tabulas Systematicas, cum Introductione et Iconibus, etc. 1–87. Hafniae.

Carpenter, G. H. 1904. Report on the Pantopoda collected by Prof. Herdman at Ceylon in 1902. Report to the Government of Ceylon on the Pearl Oyster fisheries of the Gulf of Manaar 2, Supplementary Report XIII: 181–184.

Child, C. A. 1979. Shallow-water Pycnogonida of the Isthmus of Panama and the coasts of Middle America. Smithson. Contrib. Zool. 293: 1–86.

_________. 1982. Pycnogonida of Carrie Bow Cay, Belize. Page 355–380 *in* K. Rutzler and I. G. Macintyre, eds. The Atlantic barrier reef ecosystem at Carrie Bow Cay, Belize, 1: Structure and communities. Smithson. Contrib. Mar. Sci. 12.

_________. 1988. Pycnogonida of the western Pacific islands, III: Recent Smithsonian-Philippine Expeditions. Smithson. Contrib. Zool. 468: 1–32.

_________. 1992. Shallow-water Pycnogonida of the Gulf of Mexico. Memoirs of the Hourglass Cruises IX(1):1–85. Fla. Dept. Nat. Resour., Bur. Mar. Res., January 1992.

Cole, L. J. 1904. Pycnogonida of the west coast of North America. Harriman Alaska Expedition 10: 249–298.

________. 1906. A new Pycnogonid from the Bahamas. Amer. Nat. 40: 217–222.

Dohrn, A. 1881. Die Pantopoden des Golfes von Neapel und der angrenzenden Meeresabschnitte. Monographie der Fauna und Flora des Golfes von Neapel 3: 1–252.

Fabricius, J. C. 1794. Entomologia Systematica Emendata et aucta 4: 416–417. Hafniae.

Flynn, T. T. 1929. Pycnogonida from the Queensland Coast. Mem. Qld. Mus. 9: 252–260.

Gordon, I. 1932. Pycnogonida. Discovery Reports 6: 1–138.

Hedgpeth, J. W. 1943. Pycnogonida from the West Indies and South America collected by the ATLANTIS and earlier expeditions. Proc. New England Zool. Club 22: 41–58.

___________. 1948. The Pycnogonida of the western north Atlantic and the Caribbean. Proc. U.S. Nat'l. Mus. 97(3216): 157–342.

Hilton, W. A. 1942. Pantopoda (continued), II. Family Callipallenidae. J. Entom. Zool. of Pomona College 34(2): 38–41.

Hoek, P. P. C. 1881. Report on the Pycnogonida dredged by HMS CHALLENGER 1873–76. Reports of the scientific results of the exploring voyage of HMS CHALLENGER 3(10): 1–167.

Kroyer, H. 1845. Bidrag til Kundskab om Pycnogoniderne eller Søspindlerne. Naturhistorisk Tidskrift, Kjøbenhavn, (ser. 2) 1: 90–139.

Marcus, E. 1940. Os Pantopoda brasileiros e os demais sul-americanos. Boletin da Faculdade de Filosofia, Ciencias e Letras da Universidad de São Paulo 19 (Zool. 4): 3–179.

McCloskey, L. R. 1967. New and little known benthic pycnogonids from North Carolina. J. Nat. Hist. 1: 129–134.

Müller, H.-G. 1992. Shallow-water Pycnogonida from Barbados, Lesser Antilles with description of *Anoplodactylus justi* n. sp. Studies on the natural history of the Caribbean region 71: 42–52.

Nakamura, K. and C. A. Child. 1983. Shallow-water Pycnogonida from the Izu Peninsula, Japan. Smithson. Contrib. Zool. 386: 1–71.

___________. 1988. Pycnogonida of the western Pacific islands, IV: On some species from the Ryukyu Islands. Proc. Biol. Soc. Wash. 101(3): 662–670.

Philippi, A. 1843. Über die neapolitanischen Pycnogoniden. Archiv für Naturgeschichte (1) 9: 175–182.

Sars, G. O. 1877. Prodromus descriptionis Crustaceorum et Pycnogonidarum, quae in expeditione norvegica anno 1876 observavit. Archiv for Mathematik og Naturvidenskab, Kristiania 2: 237–271.

Schiödte, J. C. 1857. Udsigt over Grønlands Land Ferskvands og Strandbreds-Arthropoder. Pages 50–74 *in* H. Rink, ed. Grønland geografisk og statistisk beskrevet 2(3): 50–74. Kjøbenhavn.

Stock, J. H. 1954a. Four new *Tanystylum* species, and other Pycnogonida from the West Indies. Studies of the Fauna of Curaçao 5(24): 115–129.

_________. 1954b. Pycnogonida from Indo-West-Pacific, Australian and New Zealand waters. Papers from Dr. Th. Mortensen's Pacific Expedition 1914–1916. Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjobenhavn 116: 1–168.

_________. 1955. Pycnogonida from the West Indies, Central America and the Pacific Coast of North America. Papers from Dr. Th. Mortensen's Pacific Expedition 1914–1916. Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjobenhavn 117: 209–266.

_________. 1957. Pantopoden aus dem Zoologischen Museum Hamburg. 2 (= IV-VI). Mitteilungen aus dem Zoologischen Museum in Hamburg 55: 81–106.

_________. 1975. Pycnogonida from the continental shelf, slope, and deep sea of the tropical Atlantic and East Pacific. Biological Results of the Univ. Miami deep-sea expeditions, 108. Bull. Mar. Sci. 24: 957–1092.

_________. 1986. Pycnogonida from the Caribbean and the Straits of Florida. Biological results of the Univ. Miami deep-sea expeditions. Bull. Mar. Sci. 38: 99–441.

Verrill, A. E. 1900. Additions to the Crustacea and Pycnogonida of the Bermudas. Trans. Conn. Acad. Arts Sci. 10(2) (ser. 15): 580–582.

Wilson, E. B. 1878. Synopsis of the Pycnogonida of New England. Trans. Conn. Acad. Arts Sci. 5: 1–26.

___________. 1880. Sinopsis of the Pycnogonida of New England. Reports U.S. Fish. Comm. 6: 465–506.

___________. 1881. Report on the Pycnogonida. Reports on the results of dredging.*Blake.* Bull. Mus. Compar. Zool., Harvard 8(12): 239–256.

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